NONINVASIVE METHOD TO MEASURE THE ROTATIONAL INSTABILITY OF THE KNEE IN ACL-DEFICIENT INDIVIDUALS

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Objective: Various radiological techniques have provided insight into 3D knee kinematics; however, non-invasive functional assessments of dynamic rotational instability are still scarce. The purpose of this study was to develop and test a novel means of assessing rotational instability in ACL-d individuals. **Design and Settings**: A within and between subject descriptive design was used to assess lower extremity kinematics in ACL-d and control groups. The dependent variables included internal/external rotation range of motion at the hip, knee, and ankle throughout five full revolutions of stationary cycling. A three-way ANOVA was used to assess group (control vs. ACL-d), limb (involved vs. non-injured), and position (neutral vs. internally rotated) differences. Intraclass correlation coefficients (ICC) and standard error of measurements (SEM) were used to assess both intra- and intersubject reliability and precision. **Subjects**: Ten control (24.6 ± 3.3 years, 1.76 ± .01 m, 72.1 ± 12.8 kg) and nine ACL-d subjects (25.7 ± 6.2 years, 1.79 ± .01 m, 81.2 ± 18.9 kg) participated. ACL-d subjects were diagnosed following physical examination, x-ray, and MRI by an experienced orthopeadic surgeon. Subjects in the control group were free of recent injury and/or surgery to the lower extremities. The control subjects were further examined with physical examinations and questionnaire by an orthopaedic surgeon surgeon to verify clinical and functional rotational stability. **Measurements**: Kinematic data during cycling were collected at 120 Hz using a 3D infrared motion analysis system. A cycling ergometer model was used because of the external resistance, pedaling frequency, pedal angles, and seat height that can be easily adjusted. Additionally, cycling with an internally rotated pedal was thought to reproduce the ‘pivot-shit’, a common clinical test for ACL-d knees. Subjects pedaled on an electronically braked cycling ergometer at a constant speed (76 rpm) and resistance (25 watts) with the foot securely attached in a neutral or 15° internally rotated position. Standardized seat height (0.87*Inseam length) was used. **Results**: No significant differences were found between groups, limbs, and positions ($p > 0.05$). Intra and intersubject reliability and precision were ICC = 0.83 ± 0.20, SEM = 0.70°± 0.46 and ICC = 0.59 ± 0.20, SEM = 5.08°± 1.84, respectively. **Conclusions**: The internally rotated pedal position in the ACL-d group did not reproduce the anticipated lower extremity internal/external rotational instabilities, possibly due to neuromuscular compensations. Decreased intersubject reliability and

precision make this method difficult to use in a group comparison design (control vs. ACL-d).

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